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Ecological Distribution of Small Mammals on the Pine Hills Field Station and Environs in Southwestern Illinois

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Abstract. —Twelve Twelve species of mammals were taken from 7 habitat types in an intensive trapping study between June 22 and August 29, 1968, at Pine Hills, Union County, Illinois. A total of 203 mammals were taken in 9,344 trap nights for a trapping success of 2.2%. *Peromyscus leucopus,* making up 58.1% of the total captures, was the dominant small mammal in the Pine Hills area and was the only mammal to be taken in all habitat types. *Blarina brevicauda* and *Microtus ochrogaster* were abundant in the lowland forest and grassy habitats, respectively. The other species were taken in low numbers and were more restricted in their distribution to particular habitat types, although much overlap did occur.

It is known that distinct habitat types often have characteristic small mammal populations associated with them. One geographical area may have several distinct habitat types ; such an area is the Pine Hills, Union County, Illinois. In this study some of these habitat types were delineated and sampled in an effort to ascertain the makeup of their small mammal populations.

STUDY AREA

The Pine Hills area is located approximately two miles east of Aldridge in northwestern Union County, Illinois. It includes the three miles of north-south oriented bluffs called the Pine Hills, as well as the large swamp which lies at the foot of the bluffs on the Mississippi River floodplain. The Big Muddy River is immediately to the north ; Wolf Lake Swamp is to the south. Southern Illinois University has maintained a Field Station in this area since 1959. Previous scientific work on the vascular flora (Ashby and Kelting, 1963 ; Mohlenbrock, 1959; Mohlenbrock, Dillard, and Abney, 1961 ; Mohlenbrock and Engh, 1964; Mohlenbrock and Voigt, 1965 ; and Voigt and Mohlenbrock, 1964) ; the nonvascular flora (Brandoni and Parsons, 1966 ; and Weik and Mohlenbrock, 1963) ; the fishes (Gunning and Lewis, 1955) ; the

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and

herpetofauna (Cagle, 1942 ; and Rossman, 1960) ; the mammals (Klimstra, 1969 ; and Layne, 1958) ; and the geology (Leighton, Ekblaw, and Horberg, 1948) has pointed to the uniqueness of the Pine Hills area.

Seven distinct habitat types were defined, based on the vegetation and topography within a limited area. These seven habitat types and their descriptions are as follows, with scientific names of plants within each habitat according to Jones (1950) .

The Lowland Hardwood Forest habitat was the low swampy woodland around and to the west of Otter Pond at the Pine Hills Field Station. The canopy was predominantly sweet gum *(Liquidambar styraci fl ua)* , swamp cottonwood *(Po pul us hetero ph ylla)* , chinquapin oak *(Quercus muhlenbergii)* , white oak *(Q. alba)* , and shagbark hickory *(Carya ovata)* . Understory along the edge of Otter Pond was red maple *(Jeer rubrum)* , buttonbush *(Cephalanthus occidentalis)* , and pawpaw *(Asimina triloba).* Dogwood *(Cornus florida),* Kentucky coffee tree *(Gymnocladus dioica),* and redbud *(Cercis canadensis)* were present, but not at the immediate swamp edge. Ground vegetation was primarily poison ivy *(Rhus radicans)* and Virginia creeper *(Parthenocissus quinquefolia),* with lizard-tail *(Saururus cernuus)* and arrowleaf *(Sagittaria latifolia) olia)* common near the pond edge. Leaf litter was extremely sparse. Much of this woodland is under several inches of water during the early spring. Three Field Station buildings are also located in this area.

The Upland Hardwood Forest was not a true or typical hardwood forest because yellow pine *(Pinus echinata)* was sparsely interspersed throughout the area. The canopy was predominantly black oak *(Querens velutina)* , post oak *(Q. stellata)* , blackjack oak *(Q. marilandica)* , black walnut *(Juglans nigra)* , and yellow pine. Understory was dogwood, redbud, and farkleberry *(Vaccinium arboreum)* . Ground vegetation on the cherty slopes was sparse, with New Jersey tea *(Ceanothus americana)* , poison ivy, Virginia creeper, flowering spurge *(Euphorbia corollata)* , and goat's-rue *(Tephrosia virginiana)* the most common species present.

Hummocks out from the limestone bluff along the eastern side of Otter Pond made up a small, but unique habitat. These narrow projections, 3-6 feet across, into Otter Pond are isolated from the lowland forest by water during most of the year yet connections across the limestone bluff still remain. No large trees were present on the hummocks. However, red maple, pawpaw, and persimmon *(Diospyros virginiana)* were fairly large. Swamp rose *(Rosa palustris),* spice-bush *(Lindera benzoin),* catbrier *(Smilax* sp.) marsh St. John's-wort *(Triadenum wal teri)* , touch-me-not *(Impatiens bi fl ora)* , and lizard-tail made up the understory and ground cover.

Dense Matted Grass along the Big Muddy River Levee also provided a

dense matted fescue grass *(Festuca elatior)* and the absence of trees. Trumpet creeper *(Cam psis rad icans)* , partridge-pea *(Cassia f asciculata)* , dewberry *(Rubus flagellaris)* , Illinois mimosa *(Desmanthus illinoensis)* , and poison ivy were interspersed among the fescue. The levee was periodically mowed.

The Railroad Right-of-Way with its sparse vegetation, partially due to rock pilings along the banks of the tracks, was another unique habitat type. Three areas along the right-of-way were trapped. One area near the town of Wolf Lake had Johnson grass *(Sorghum halepense),* ragweeds *(Ambrosia* sp.) , fescue, trumpet creeper, and smooth sumac *(Rhus glabra)* as its primary vegetation. Near Aldridge, smooth sumac, dewberry, alfalfa *(Medicago sativa),* ragweeds, partridge-pea, and coralberry *(Symphoricarpos orbiculatus)* were the most common plants. To the north near a railroad bridge, horsetail *(Equisetum sp.),* cheat *(Bromus secalinus),* trumpet creeper, ragweeds, and poison ivy were dominant.

Weedy Fields were defined as a sixth habitat type, and three fields were sampled. One field near a woods was almost entirely Johnson grass. Ragweeds were the most abundant plants in the second field, but poison ivy, Johnson grass, partridge-pea, goldenrod *(Solidago* sp.) , blackberry *(Rubus sp.),* purpletop grass *(Triodia flava),* and evening primrose *(Oenothera biennis)* were common. The ragweed field was near a lowland forested area. The third weedy field was near a cornfield. Trumpet creeper, partridge-pea, ragweeds, and fescue were the primary plant species. Of these three fields only the Johnson grass field was fallow. It apparently had been cultivated the year before.

Two unusual areas were sampled in the Ridge Top Habitat. A wooded area composed of beech *(Fagus grand i f olio)* , black gum *(Nyssa sylvatica)* , tulip poplar *(Liriodendron tulipi f era)* , and black locust *(Robinia pseudoacacia),* which are generally considered to be more lowland rather than upland in occurrence, was trapped. Poison ivy was the primary ground vegetation. The other unusual Ridge Top area that was trapped was a hill prairie. Little bluestem *(Andropogon scoparius),* side-oats grama *(Bouteloua curtipendula),* and purple prairie clover *(Petalostemum purpureum)* covered the hill prairie, with prairie crab apple *(Pyrus ioensis)* occurring along the fringes.

METHODS

Trapping was initiated June 22, 1968, and terminated on August 29, 1968. Snap traps, Havahart live traps, and tin cans sunk in the ground were utilized in determining the number and distribution of small mammals in the study areas. A mixture of peanut butter and oat meal was used as bait in the snap traps, and apple sections were used in the live traps. No bait was used in the sunken cans. The straight line method of snap trapping with stations set at intervals of 50 feet, three traps per station, was used in all areas except near the edge of Otter

Pond where intervals of 12 1/2 feet were used until a distance 50 feet from the pond was reached. Snap traps on the hummocks were not set at intervals of 50 feet, but were randomly spaced because of the small area involved. Thirty-two cans were sunk in the ground near the edge of Otter Pond in the Lowland Hardwood Forest. This was the only area where cans were employed. Live traps were used only in the Lowland Hardwood Forest and on the Hummocks and were also randomly placed. The number of snap traps to be set per area was determined by the size and diversity of the habitat. The Lowland and Upland Hardwood Forests were each trapped for two weeks because of their large sizes. All of the other habitats were trapped for one week each. The sunken cans were checked each time the Pine Hills area was visited.

RESULTS AND DISCUSSION

Trapping success was low, 2.2% for all habitats, with 203 specimens taken in 9,344 trap nights (Table 1) . Much of this poor success may be attributed to the fact that natural foods were readily available and the animals were not easily baited. Twice during the sampling period hard rains set off most of the snap traps. These were the only instances in which weather was know to affect the trapping success. Twelve species of mammals were taken during the study period. Scientific names of mammals follow Hoffmeister and Mohr (1957) .

Seven species were taken in 3,144 trap nights in the Lowland Hardwood Forest. The short-tailed shrew *(Blarina brevicauda)* and the white-footed mouse *(Peromyscus leucopus)* were the most abundant. *B. brevicauda* was most commonly taken within 100 feet of the edge of Otter Pond. *P. leucopus* was taken throughout this habitat. The only specimen of golden mouse *(Peromyscus nuttalli)* taken during the study was snap trapped in a clump of Kentucky coffee trees about 50 feet from the swamp edge. Three pine voles *(Pitymys pinetorum)* were taken in can traps near the edge of Otter Pond. One house mouse *(Mus musculus)* was taken from a building at the Pine Hills Field Station. Live traps yielded one chipmunk *(Tamias striatus)* and one opossum *(Didelphis marsupialis)* .

Peromyscus leucopus accounted for 100% of the mammals taken in the Upland Hardwood Forest habitat. The trapping success for 1,884 trap nights was 2.6%. The sparse ground cover and the rocky and cherty slopes apparently were not suitable to other small mammals. The white-footed mouse apparently uses holes in some of the larger rocks as nesting areas because several specimens were taken on and near large rocks.

Hummocks projecting into Otter Pond were found to be used by four species of mammals. The small size, rarely exceeding 20 square feet in area, and the partial isolation from the Lowland Hardwood Forest made this a very interesting habitat. Trapping success was 1.7%. . *P. leucopus* and *B. brevicauda* probably reached the hummocks at times

when the water level in Otter Pond was low and connections along the ground existed. It is possible, however, that they could have moved across the connecting limestone bluff to the hummocks. Four wood rats *(Neotoma floridana)* were taken in 704 trap nights on the hummocks. Wood rats are more closely associated with the limestone bluff adjoining the hummocks than with the hummocks themselves but frequented the latter while feeding. It is doubtful that wood rats moved very far from the bluff because none was taken anywhere else except on the hummocks at the bluff base. Raccoons *(Procyon lotor)* were observed feeding at the edge of the hummocks and moving across the limestone bluff from one hummock to the next. Four young raccoons were taken in live traps on the hummocks.

Five species were taken in the Dense Matted Grass of the Big Muddy River Levee. Trapping success for this habitat, 4.5% for 600 trap nights, was the highest for any habitat sampled. The prairie vole *(Microtus ochrogaster)* was the most frequently trapped species. Its runways were numerous and extensive under the matted fescue. *P. leucopus* ranked next in numbers taken in this habitat. This was the first time that the white-footed mouse had been found away from a wooded area. It has been suggested that *P. leucopus* enters open fields, owing to population pressures in adjacent woods (Blair, 1940) . No deer mice *(Peromyscus maniculatus)* were taken in this study, although Klimstra (1969) reported the deer mouse to be the fourth most abundant small mammal in the Pine Hills area. One least shrew *(Cryptotis parva)* was trapped in a runway made by *M. ochrogaster.* Two pine voles and one house mouse were also taken in the Dense Grass.

Three areas along the Railroad Right-of-Way yielded six species of small mammals. Trapping success for all three areas was 2.3 % for 1,500 trap nights. *P. leucopus* made up 65.7% of the catch here. *M. ochrogaster* was taken only in those areas containing fescue. *B. brevicauda* was taken in a stand of smooth sumac. This area was drier and more open than the other areas where the short-tailed shrew had been taken. Four house mice were taken in a weedy section of the Wolf Lake trapping area. One C. *parva,* the second to be taken during this study, was trapped in a dense stand of partridge-pea. It is to be noted that Klimstra (1969) , reporting on 16 years of trapping data at Pine Hills, found only two specimens. This same clump of partridge-pea also yielded one meadow jumping mouse *(Zapus hudsonius)* .

Trapping success in the Weedy Fields habitat was 2.8% for 780 trap nights. House mice appear to be associated more commonly with weedy fields than with any other habitat. The house mouse and the white-footed mouse were the most commonly taken small mammals in the Weedy Fields. The meadow vole was also prominent in grassy portions of the Weedy habitat. Two *Z. hudsonius* were trapped in a partridge-

pea stand as had been the case with the specimen collected on the Railroad Right-of-Way. One *B. brevicauda* was taken alongside a cornfield in a weedy situation.

Trapping success, 1.1% for 732 trap nights, in the Ridge Top habitat was the lowest of any area. Only four *P. leucopus* were taken in the beech woods. However, these four specimens accounted for 100% of the trapping success in this area. The hill prairie yielded two white-footed mice and two pine voles.

SUMMARY

The dominant small mammal in the Pine Hills area, *Peromyscus leucopus,* made up 58.1% of the total number of captures during the study. Klimstra (1969) also found the white-footed mouse to be the dominant small mammal in the Pine Hills area as it made up 41.9% of all of his captures. The white-footed mouse demonstrated its versatility since it was found in every habitat sampled.

Blarina brevicauda was the second most abundant small mammal recorded, representing 13.3% of the total catch. This was also found to be the case by Klimstra (1969) . He also reported *Blarina* to be taken in larger numbers from dry woodlands and in open grassy fields, whereas this study found the short-tailed shrew most common in moist lowland woods.

The prairie vole *(Microtus ochrogaster)* was the third most commonly taken small mammal, representing 10.3% of the catch. Klimstra (1969) also recorded *Microtus* as the third most abundant species at Pine Hills. In both studies *Microtus* was almost exclusively found in grassy areas. *Microtus* was taken in three habitats : the Matted Grass, the Railroal Right-of-Way, and the Weedy Fields.

Mus musculus was the fourth most commonly taken mammal. *Mus* made up 6.4% of the total captures and was most common in weedy situations, such as the Weedy Fields and the Railroad Right-of-Way. Klimstra (1969) reported the deer mouse *(Peromyscus maniculatus)* to be the fourth most abundant mammal at Pine Hills, but no deer mice were taken in this study. *Mus* represented 8.6% of the captures reported by Klimstra (1969) .

Pitymys pinetorum was taken in three very distinct habitat types, the Lowland Hardwood Forest, the Dense Matted Grass, and the Ridge Top hill prairie. The pine vole was found to represent 3.4% of the total captures. This far exceeds the 0.6% of the total captures reported by Klimstra (1969) .

Wood rats were found only on the Hummocks by the Otter Pond bluff. *Neotoma* made up less than 2% of the captures.

Zapus hudsonius, representing 1.4% of the catch, was captured in the Weedy Field and Railroad Right-of-Way habitats. The three jumping mice captured were all taken in association with partridge-pea.

Two captures of *Cryptotis parva,* accounting for less than 1% of the total captures, were taken in the Matted Grass and in the Railroad Right-of-Way habitats. Klimstra (1969) recorded only two least shrews in 16 years of small mammal trapping at Pine Hills.

The Lowland Hardwood Forest yielded the only golden mouse *(P. nutalli)* and the only chipmunk *(Tamias striatus)* taken during this study. Four raccoons and one opossum were also taken from this habitat type

TABLE 1. Results of Small Mammal Trapping by Habitat Type in the Pine Hills, Union County, Illinois, June 22—August 29, 1968.

Type of Habitat	Number of Trap Nights	Number of Captures of Each Species												Total Captures	Percent Trapping Success
		Peromyscus leucopus	Peromyscus nuttalli	Ptlymys pinetorum	Zapus hudsonius	Microtus ochrogaster	Neotoma floridana	Tamias striatus	Mus musculus	Blarina brevicauda	Cryptotis parva	Didelphis marsupialis	Procyon lotor		
LOWLAND HARDWOOD FOREST															
(Forest)	1752	15	1	0	0	0	0	0	0	12	0	0	0	28	1.6
(Buildings)	80	3	0	0	0	0	0	0	1	0	0	0	0	4	5.0
(Can Traps)	1152	0	0	3	0	0	0	0	0	12	0	0	0	15	1.3
(Live Traps)	160	0	0	0	0	0	0	1	0	0	0	1	0	2	1.3
Totals	3144	18	1	3	0	0	0	1	1	24	0	1	0	49	1.5
UPLAND HARDWOOD FOREST															
(Cherty Slopes)	1884	50	0	0	0	0	0	0	0	0	0	0	0	50	2.6
Totals	1884	50	0	0	0	0	0	0	0	0	0	0	0	50	2.6
HUMMOCKS															
(By Bluff)	480	3	0	0	0	0	0	0	0	1	0	0	0	4	0.8
(Live Traps)	224	0	0	0	0	0	4	0	0	0	0	0	4	8	3.6
Totals	704	3	0	0	0	0	4	0	0	1	0	0	4	12	1.7
MATTED GRASS															
(Levee)	600	11	0	2	0	12	0	0	1	0	1	0	0	27	4.5
Totals	600	11	0	2	0	12	0	0	1	0	1	0	0	27	4.5
RR RIGHT-OF-WAY															
(Wolf Lake)	180	5	0	0	0	2	0	0	4	2	0	0	0	13	7.2
(Aldridge)	1200	15	0	0	1	0	0	0	0	0	1	0	0	17	1.4
(RR Bridge)	120	3	0	0	0	2	0	0	0	0	0	0	0	5	4.2
Totals	1500	23	0	0	1	4	0	0	4	2	1	0	0	35	2.3
WEEDY FIELDS															
(Johnson Grass)	240	3	0	0	0	0	0	0	0	0	0	0	0	3	1.3
(Ragweeds)	360	1	0	0	2	2	0	0	1	0	0	0	0	6	1.7
(Cornfield)	180	3	0	0	0	3	0	0	6	1	0	0	0	13	7.2
Totals	780	7	0	0	0	5	0	0	7	1	0	0	0	22	2.8
RIDGE TOP															
(Woods)	612	4	0	0	0	0	0	0	0	0	0	0	0	4	0.7
(Hill Prairie)	120	2	0	2	0	0	0	0	0	0	0	0	0	4	3.3
Totals	732	6	0	2	0	0	0	0	0	0	0	0	0	8	1.1
GRAND TOTALS	9344	118	1	7	3	21	4	1	13	28	2	1	4	203	2.2

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